Impact of Modern Agricultural Practices on Production, Productivity and Farm Efficiency: A case Study of district Gumla

A Synopsis

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1.State Of The Art

Land resources play a strategic role in the determination of man's economic, social and cultural progress. It is necessary for human existence. since it provides him with living space, with food and with its vast variety of raw materials used in the satisfaction of human wants.

Agriculture is the practice of cultivating crops, raising livestock, and producing food, fiber, and other products for human use.

Modern agricultural practices encompass a range of techniques and technologies aimed at maximizing efficiency, productivity, and sustainability in food production. These practices often include precision farming, use of genetically modified organisms (GMOs), mechanization, drip irrigation, integrated pest management, to prevent biodiversity loss and to maintain soil fertility. Overall, modern agriculture seeks to optimize resource use while minimizing environmental impact.

Productivity refers to output per hectare of land. Productivity in agriculture also refers to the efficiency of producing crops or raising livestock, typically measured by output per unit of input (such as land, labor, or capital). It involves various factors like technological advancements, crop genetics, irrigation methods, fertilization techniques, and management practices. Improving productivity in agriculture is crucial for meeting the food demands of growing population while minimizing environmental impact and resource use.

Production simply means the total output produced. Production in agriculture refers to the total output of crops, livestock, or other agricultural products within a

given period of time, typically measured in terms of quantity (e.g., bushels of wheat, tons of meat, liters of milk). It focuses on the sheer volume or amount of goods produced.
Farm efficiency refers to the overall effectiveness of a farm in achieving its objectives, which can include maximizing profits, minimizing costs, or achieving sustainability goals. Farm efficiency takes into account not only the production process but also management practices, resource allocation, marketing strategies, and decision-making. It involves optimizing the use of all farm resources, including land, labor, capital, and technology, to achieve desired outcomes.

Agriculture is the main source of livelihood for more than half of the world's population. In some countries more than 70 per cent of the inhabitants support themselves by farming, while in the more industrialized countries the proportion range is much lower. In looking back upon the history of the more developed countries, one can see that agriculture must be able to produce a surplus of food to maintain the growing non agricultural labor force. Since food is more essential for life than are the services provided by merchants or bankers or factories, an economy cannot shift to such activities unless food is available for barter or sale in sufficient quantities to support those engaged in them.

Agricultural development involves Modern agricultural practices by improving farming practices, increasing crop yields, enhancing food security, and promoting sustainability in rural areas. This can include technological advancements, infrastructure improvements, training programs for farmers, and policies to support agricultural growth. Modern Agriculture practices started in the mid 1960s in India. As clear by the name, it is the modernisation in agriculture by changing the methods and Technology in field of agriculture such as using mechanized tools like Tractors, threshers etc with genetically improved versions of seeds whose productivity is very high in comparison of traditional seeds and are known as HYV(high yield variety) seeds. It is known by the name of Green Revolution which was initiated by Dr MS Swaminathan and is particularly known as the First phase of Green Revolution.

First phase of the green revolution focused primarily on the development and adoption of high-yielding varieties (HYVs) of staple crops such as wheat and rice.

These new varieties were specifically bred to produce higher yields when grown with intensive fertilizer, irrigation, and pesticide inputs. This phase aimed to address food shortages and increase agricultural productivity, particularly in developing countries, by introducing modern agricultural practices and technologies.

While the Green Revolution brought significant improvements in agricultural productivity and helped alleviate hunger in many regions, it also led to several challenges and negative consequences such as Environmental Degradation by Intensive use of chemical fertilizers and pesticides has resulted in soil degradation, water pollution, loss of biodiversity, and disruption of ecosystems. Water Depletion because igh-yielding crop varieties often require large amounts of water for irrigation, leading to the depletion of groundwater reserves and conflicts over water resources. Social Inequity as the benefits of the Green Revolution have not been evenly distributed, leading to disparities in wealth, access to resources, and market power, particularly disadvantaged smallholder farmers and rural communities. Health Risks is also a resultan caused by Pesticide exposure

Addressing these challenges requires a shift towards more sustainable and equitable agricultural systems, emphasizing practices that promote environmental stewardship, social justice, and resilience to future challenges such as climate.

Farm efficiency is basically the outcome of the second phase of the green revolution. The second phase of the Green Revolution builds upon the achievements of the first phase but also addresses its limitations and negative consequences. Here are some key aspects:

- Sustainability: There's a stronger emphasis on sustainable agricultural practices that minimize negative environmental impacts such as soil degradation, water pollution, and biodiversity loss. This includes promoting techniques like conservation, crop rotation, agroforestry, and integrated pest management.

- Resource Efficiency: Efficiency in resource use is prioritized, aiming to reduce inputs such as water, fertilizers, and pesticides while maintaining or

increasing yields. Techniques like precision farming, which involves using technology such as GPS and sensors to optimize input application, help achieve this goal.

- Diversification: Encouraging crop diversification and genetic diversity helps improve resilience to pests, diseases, and climate variability. This can involve promoting the cultivation of a wider range of crops and varieties, including traditional and neglected crops that are better adapted to local conditions.

- Smallholder Focus: Recognizing the importance of smallholder farmers in global food production, efforts are made to provide them with access to resources, knowledge, and markets. This includes initiatives to improve access to credit, extension services, and market information, as well as support for farmer cooperatives and collective action.

- Social Equity: Addressing social inequalities within the agricultural sector, including gender disparities in access to resources and decision-making, is another key aspect of the second phase. Promoting women's empowerment, land tenure reform, and inclusive agricultural policies are part of this effort.

Overall, the second phase of the Green Revolution aims to achieve a more balanced approach to agricultural development and farm efficiency that not only increases productivity but also promotes environmental sustainability, social equity, and resilience to future challenges such as climate change.

Modern agricultural practices have had significant impacts on production, productivity, and farm efficiency:

- Increased Production: Modern agricultural practices, such as the use of high-yielding crop varieties, mechanization, and irrigation, have led to substantial increases in agricultural production. This has helped meet the growing demand for food due to population growth and urbanization. This is need of the hour as country has to maintain buffer stock to avoid problem of hunger strike due to any future uncertainty like drought or any natural calamity.

- Improved Productivity: By adopting modern technologies and techniques, farmers have been able to achieve higher yields per unit of land, labor, and inputs. This increased productivity has allowed farmers to produce more food with fewer resources. In addition to this population is growing exponentially while land area for agriculture is shrinking every year. Only some part of the land is available for cultivation. So increasing productivity means increasing production with lesser use of land and other resources, leading to greater economic efficiency.

- Enhanced Efficiency: Modern agricultural practices have improved farm efficiency by optimizing resource use, reducing waste, and increasing output per unit of input. For example, precision farming techniques, such as precision irrigation and fertilization, allow farmers to apply inputs more accurately, minimizing losses and maximizing crop yields.

- Diversification and Specialization: Modern agriculture has facilitated crop diversification and specialization, enabling farmers to grow a wider range of crops and adapt to changing market demands. This has led to increased profitability and resilience to market fluctuations.

- Reduced Labor Intensity: Mechanization and automation have reduced the labor intensity of farming operations, freeing up labor for other activities and improving farmers' quality of life. This has also helped address labor shortages in agriculture, particularly in regions experiencing rural depopulation.

- Environmental Impacts: While modern agricultural practices have led to increased production and efficiency, they have also had negative environmental impacts, such as soil degradation, water pollution, and loss of biodiversity. Addressing these environmental challenges is essential for the long-term sustainability of agriculture.

According to the Indian economic survey (2020 -21)[1], agriculture employed more than 50% of the Indian workforce and contributed 20.2% to the country's GDP.

Agriculture still remains a significant source of employment and livelihood for a large portion of the population.

India is known as the commercial basket of the world. India has a wide variability of climate and soil and therefore produces a variety of horticulture crops such as fruits, commercial crops and medicinal plants. India produces a wide variety of commercials and has a major position in production among many countries. According to Maninder Pal Kaur (2019)[2],India is the second largest producer of commercial crops with annual production of 118.60 million tonnes. Area of commercial crops in India is 6.10 million hectares which is more than 11.80% of the average total area of the World's.

These crops play a very important role in the national Economy, because the yield per unit's area of commercial production is much higher than other crops. The economic reform in India has changed agriculture in favor of commercial crops. India accounts for 16 percent of world production of commercial crops and 11 percent of the world fruit production. India is also the largest producer of Cotton which accounts for 54% of the world production. According to Land Revenue Department(2022)[3], India has total Geographical area of 329 million hectare in which Net sown area is 46.10%.

Jharkhand is 28th state of India. According to Indian census(2011)[4], Jharkhand has total area of 79,714 km^2. Total population of Jharkhand is 3,29,88,134. Jharkhand is a state located in the eastern part of India. It is landlocked and shares its borders with several other states. Here are the geographical outlets or neighboring states and countries of Jharkhand:

Neighboring States are Bihar to the north,Uttar Pradesh to the northwest, Chhattisgarh to the west,Odisha to the south, West Bengal to the east. Jharkhand is characterized by a diverse topography, including hills, plateaus, and forests. The Chota Nagpur Plateau covers a significant portion of the state, giving it a unique landscape. The Damodar River, one of the major rivers of the region, flows through Jharkhand.

Jharkhand had a significant portion of its population engaged in agriculture. According to Jharkhand Economic Survey(2022-23)[5], 55% of the state's workforce involved in agriculture sector and contributes 26% in GSDP. However, these figures can change over time due to various factors such as economic development, urbanization, and shifts in employment patterns.

According to Prakash Chandra Deogharia, (2018)[6], The study on "Transformation in agriculture in Jharkhand" revealed that the cropping pattern has shifted from lower value crops to high value crops in the state. Paddy is a major crop grown in state. The area under paddy crop is declining continuously, but acreage under wheat crop is increasing in the state. The study further shows that the minor millet crop area is declining in the state continuously and reaching a negligible level. The performance of pulses and oil seeds crops are improving year after year as indicated by increase in area, production and productivity in the state. The vegetable crop's area has contributed significantly in cropping pattern showing nearly 11% during 2012–13 which was near about 7% in 2000. The fruit acreage has also increased during 2000 to 2012 in the state. The rate of growth was nearly three times in the state during this period. It was also found that there have been significant changes in consumption of chemical fertilizers (NPK) in the state showing near about three times higher from the base year 2001. The improved technology in agriculture has considerably increased the total food grain production in the state. On the whole, it is clearly indicated that technology transformation in agriculture has taken place in the state.

Gumla is a district located in the southwestern part of the state of Jharkhand, India. It is a landlocked district with specific geographical outlets connecting it to neighboring areas. Neighboring Districts are Simdega to the north,Khunti to the northeast,Ranchi to the east,Latehar to the northwest.

The geographical features of Gumla include hilly terrain and forested areas. The district is part of the Chota Nagpur Plateau, contributing to its diverse topography. The Subarnarekha River flows through the northern part of the district. Gumla has area of 5327 km^2 and population of 1,025,213. 65% of the population is working as farmers and 20% as agriculture laborers. Which points to agriculture as the main source of livelihood in Gumla district.

According to Jharkhand Krishi Digdarshika by CV Singh, Yogesh Kumar, Dipankar Maiti,(2012)[7], In district Gumla, farmers are moving towards production of cash crops like millets, groundnut, sugarcane, maize etc to promote their income and to meet the market needs. Paddy is the major crop grown in this region.

Bishunpur, Ghagra, Palkot, Sisai and Gumla are chosen blocks of district Gumla for my study area. As krishi vigyan kendra as well as farming is practicing here in wide range and some farmers have adopted modern technique of aAgriculture.

I chose this topic for my research because in recent past years, modern agriculture practices have impacted the productivity, production and farm efficiency in India. A similar trend has been observed in Jharkhand state too. To highlight its impact on the production, productivity and farm efficiency of district Gumla, my research would be carried out. It will help in boosting and upliftment of the region and bridge the gap between inequitable distribution of income in study area, poverty eradication and rural development of the region.

Some of the literature on its various aspects are:-

Akudugu, (2012) in his paper discusses the determinants of factors responsible for adoption of modern agricultural production. For this purpose he used the Logit model and Results revealed that decision to adopt modern technology in farming was significantly influenced by
economic factors (farm size and expected benefits), social factors (age, gender, education level) and institutional factors (access to information and extension services). Farm modernisation is influenced by several other factors rather than land labour ratio and was responsible for growth of agriculture.

Bhavani and Bharati, (2016) in his paper aimed at an efficient method to incorporate precision farming in Indian Agriculture using robotics and the internet of things. They suggested espite the Green Revolution and the use of modern

farming technologies, farmers are unable to make large incomes. The need of the hour is to boost productivity and ensure that farmers profit as much as possible. Methods that are both efficient and cost-effective should be made available in a country like India, where monsoon-dependent farming practices are the norms.

Chowdhary, (1997) suggested that small and marginal forms have ferolable attitude towards chemical fertilizers but due to some inherent constraints (non availability finance) they were unable to maintain the recommended level of fertilizer use.

Chowdhary and Bose, (1986) in his study experimented on mustard RW 351 (Brasi Cajun pea) comprising irrigation treatment and 3 fertilizer levels was conducting during the winter season of 1982-83 and 1983-84 at Kalin foong. The results revealed that Fertilizer (N.P.K.) and irrigation significantly increased the yield and yield contribution characters.

Johnston and Mellor, (1961) focused on commercial demand for agricultural produce increases due to income and population development, urbanization, and trade liberalization. He said that the Marketed supply simultaneously rises due to productivity improvements in production, after harvest processing and distribution systems

Joshi, (2015) discusses Innovations in Financing of Agri-food value chains in China and India and suggested some lessons and policies for Inclusive financing agricultural Economy.The purpose of this research was to compile lessons learned from agricultural value chain models in China and India, as well as their associated financing mechanisms, to give policy recommendations on how to best support the construction of efficient and inclusive value chains. The study is
based on a review of existing literature on agricultural value chains and related financing approaches, and it provides conclusions on how to improve the interface between product and financial markets so that smallholders can profit from value addition. According to the researcher's comparative assessment of value chain and existing legislative frameworks, internal financing of value chains (in terms of providing inputs, technology, and services) predominates in both countries. Financial institutions and governments may use the lessons learned from various

value chain models and their financing methods to improve value chain finance in small-scale agriculture. India's agriculture business is the country's principal source of revenue. Agriculture is the bedrock of development. Agriculture directly employs over 70% of India's population.

Kamaljit, (2014) investigated Modern agricultural Practices and analysis of socio-economic and ecological impacts of development in the agriculture sector, Punjab, India. She analyzed a figure of agriculture trends in the last 40 years about total production, fertilizers and a land area of global irrigated land in her research.

Kumari Vanitha, (2008) analyzed the relationship between socio economic development of rural areas and farm mechanization. His findings suggested that Imbalance in socio-economic development and rural urban divide can be removed if the adoption of farm mechanization in rural areas is made adequate, and a growth-oriented business environment can be created.

Mohammad and Shaikh, (2009) examined Modern Concepts of Agricultural Research and Options for Conservation Agriculture and Resource Use Efficiency. He further said, In the second half of the twentieth century, India achieved food self-sufficiency by transitioning from traditional organic to chemical-industrial agriculture. In the new millennium, various concerns in soil health, crop production, and the environment have become critical.This necessitates a paradigm shift in farming techniques as well as a shift in research goals.

Panigrahi and Ramakrishna, (1995) exposes the growth pattern and identifies factors distressing productivity levels across state and examined the role of population in land productivity growth for the period 1967- 68 to 1991-92 in India during the after Green revolution period for main crops and non food crops. In his findings, time
series data and multiple regression method were applied.

Parvis, (2015) in his study discussed Changing Agricultural Scenario in North-East Regions with Special Reference to Assam. He said North-Eastern India's economy is based on agriculture. Agriculture is the principal source of income for the

majority of people in the North-Eastern states. As a result, agriculture plays an important role in the economy of North-East India. His findings revealed tha the majority of the people in Assam live in rural areas (89.0 percent). In Assam, the agriculture sector employs about 70% of the population. According to the 2001 census, agricultural workers make up 57.4 percent of Assam's total workforce. In 2005-06, agriculture alone contributed 28.7% to GDP.

Raju, (1975) conducted a study from the data made available from the benchmark and assessment service of the I. A. D. P. district of West Godavari (1967-68 and 1970-71) to compare (i) performance of small farmers adopting new technology with the non adaptors and (ii) resource use efficiency between the adopters and non adaptors. Based on result of his study he concluded that the rate of adoption of new technology by the small farmers increased from 1967-68 to 1970-71 in West Godavari district. (ii) The resource use was more efficient in the case of the small farmers adopted the new technology than the non adaptors

(Singh, 1972) used linear programming model workout production possibilities and resource use pattern on small farm in different regions of Uttar pradesh. The study revealed that under the existing cropping pattern farm resources were not utilized optimally on the small farms of the three regions. There was a significant increase in returns yielded by the optional plants over the existing ones.

Singh R. P., (1991) study conducted on the impact of change in technology and cultivators holding in Meerut District, revealed that farm business income of progressive farmers per hectare on land increased by about 39%.

Singh and Sharma, (1988) enquired on farm mechanization in Punjab and concluded it attributed higher income on tractor holdings (where average return was 28.47 percent higher in tractor operated farms than bullock operated farms) to a shift in cropping pattern in favor of more remunerative enterprises, increased cropping intensity, better land preparation,timely operation, better sowing and fertilizer application.

Singh and Singh, (2014) focused on the post-Green Revolution era, agriculture in Punjab underwent a significant transformation in terms of mechanization. He then

suggested that with a few exceptions, almost all tools and implements have seen exponential growth in numbers, including tractors (combines electric and diesel engine run), tube wells, disc harrows, spray pumps, reapers, and so on. Punjab's agriculture is now among the most automated in the country as a result. As a result of increasing labor shortages,mechanization appears to be one of the most effective solutions. Agriculture production and productivity on Punjab farms have increased throughout time as a result of mechanization. At the same time, the state's agriculture became too mechanized, causing farm revenues to be squeezed.

Tripathi and Prasad, (2009) attempted to evaluate the changes in agrarian structure, input use patterns and growth trends in agriculture. There was a shift of agricultural workforce from cultivators to agricultural laborers, increase in uneconomic land holdings size, shift in cultivation pattern towards non-food crops and decline in growth rate of overall primary sector except for forestry. Although agriculture is a significant source of income for rural population in India, 25.7 percent of rural population was below the poverty line in 2011-12. Socio economic factors are impacted by the complex characteristics of rural India such as difficult terrain and scattered villages, sub optimal use of natural resources and lack of extension.

2. Problems To Be Investigated

This research will be conducted by collecting data from both primary and secondary sources of the study area.

The slow growth in modernisation of agriculture can be attributed to lack of resources, funds, lack of awareness among the farmers, texture of soil, climatic conditions, problem of permanent irrigation, Area under HYV etc. Hence, there is a need for comprehensive assessment of the status of agricultural modernisation in Gumla district and comparative assessment of the affecting factors.

The evidence that holds will be collected from the study of various books and journals. The problem will be addressed by personally visiting the farms and

interacting with the farmers and questionnaire with the informants who have been the resident there and had practiced traditional farming too for producing crops.

There is also a need for comprehensive assessment of the role of modernisation of agriculture in increasing productivity,Income and Employment of the farmers and contribution to Poverty Eradication, Market linkages, Income equality and Rural Development of this region.

The research will be conducted to check the effect of modern agricultural practices on the production and productivity as well as farm efficiency with special reference to Gumla district.

3. Objective Of The Research

Following are the main objectives of the study:

i) To investigate the extent to which modern agricultural practices are being adopted in the study area.

ii) To identify the determinants of adoption of modern agricultural practices at the farm level in the study area.

iii) To examine the impact of modern agricultural practices on income of farmers and employment in the study area.

iv) To examine the impact of modern agricultural practices on production of farm products, its productivity and farm efficiency in the study area.

4. Research Hypothesis Or Research Question

To fulfill the above objective, certain hypotheses have been framed.

i) There is no significant impact of modern agricultural practices on income of farmers in the study area.

ii) There is no significant impact of modern agricultural practices on production of farm products in the study area.

#H_0: There is no significant impact of modern agricultural practices on income of farmers in the study area.
H_1:There is a significant impact of modern agricultural practices on income of farmers in the study area.

#H_0: There is no significant impact of modern agricultural practices on production of farm products in the study area.
H_2: There is a significant impact of modern agricultural practices on production of farm products in the study area.

Research Question

1. To what extent modern agricultural practices are adopted in the study area?
2. What are the factors affecting modern agricultural practices in study area?
3. By how much Income and Employment changed after adoption of modern agricultural practices?
4. By how much production of farm products, its productivity and farm efficiency has changed due to adoption of modern agricultural practices?
5. What are the impacts of modern agricultural practices on marketed and marketable surplus?

5. Research Design And Methodology

Types of Research: The rationale for the study and its proposed objective indicate that the study be undertaken as descriptive research as well as Inferential research, as the major purpose of this type of research is to describe the current situation of the district and stats which exists at present.

Data collection: The present study is entirely based on both primary and secondary data collection. The data will be collected from different sources like forest office, Krishi vigyaan kendra, books, related research papers, journals, newspaper, and govt. published reports and policies.

The research will be based on both Primary and Secondary data obtained from 40 farmers each of 5 blocks namely Bishunpur, Ghagra, Palkot, Sisai and Gumla of Gumla District. Kharif crops are taken into study as kharif crops are main crops grown in study areas. Some indicators like the number of pesticides sale centers per 1,000 of the human population, number of fertilizer sales centers per 1,000 of the human population, percentage of Net Irrigated Area to the net sown area, etc will be used.

Selection of variables: sample respondents will be the unit of study out of 12 blocks in Gumla district 5 blocks will be purposely selected as agricultural practices and technique has changed there. And the farmers from each of the block will be selected through random sampling.

Some needed formulae will be used. Such as-

To know capital ratio,

Net capital ratio = Total Assets÷ Total Liabilities
And
Income ratio = gross income×100÷ total assets.

6. Sources Of Data And Tools To Be Used In Collection Of Data

6.1 Source of data

Primary and secondary data will be used.

Primary sources:
The research will be carried out with the help of questionnaires and personal interviews from the farmers of the selected block of study area.

The research will be completed based on a Sample Survey of the study area. A Sample Survey will be conducted to testify to the facts and impacts and then accordingly plans will be suggested for the rural development of the district.

Primary data for this study is required to analyze the dynamics of technological progress and economic factors such as income and employment at the farm level and its associated multifaceted impacts.

Secondary Sources
The secondary sources of data include books, policies, reports of authentic organizations, reports of NGOs and journals etc.

6.2 Size of sample
The research used to be conducted in 200 household approximately collected through purposive Sampling and farmers further are selected through random sampling for the 40 farmers are selected from the respective blocks.

7. Analysis of data

The number of farmers who adopted modern agriculture practices with special special reference to Gumla district is considered to be independent variable (Y).

Income level is dependent variable (X1)

Production level is dependent variable (X2).

The following Tools and techniques will be adopted in the collection of data and its analysis.

Different statistical methods and techniques will be used for exact interpretation of data collected.

(1) Descriptive analysis

The statistical tools used will be table, percentage, mean, bar diagram, pie chart, bar graph, correlation, regression etc.

(2) Inferential analysis

The research will be carried out using a suitable test to test the hypothesis and formulae.

The study mainly addresses unbiased rural development based on identified indicators. Thus, this study is both qualitative and quantitative in nature.

8. Significance Of The Study

The importance of modern agricultural practices in production of farm products, its productivity and farm efficiency cannot be denied on the account of existing under development and traditional methods of agriculture across the district. The entire district does not have any industry so it is very much important to improve and promote the Agriculture Sector here and not only to develop it but to develop it with sustainability. i.e., resilient with climate change,rational use of fertilizer and pesticides and other resources like water for irrigation. The proposed topic of research will also highlight the issue of imbalance and disparity as well as suggest some plans for poverty eradication, Employment generation, Income inequality and Rural Development of the region.

9. Its Relevance To The Present Day Problem And Need Of The Society

Agricultural development is one of the most powerful tools to end extreme poverty, boost shared prosperity, and feed a projected population. Growth in the agriculture sector is two to four times more effective in raising incomes among the poorest compared to other sectors in Gumla District as it is a backward rural region of Jharkhand. Analyses found the majority of poor working adults made a living through agriculture. Modernisation in Agriculture helps to promote Income, living standard, reduction in disparity among different sections of the society by generating more Employment. So to meet the present need and feed such a Large

population, modernisation with efficient ways in Agriculture is the need of the hour.

By adopting modern agricultural practices such as precision farming, use of advanced machinery, and efficient water management techniques, Gumla can enhance crop yields, ensure food sufficiency, and improve livelihoods for farmers. Additionally, promoting diversified cropping patterns can mitigate risks associated with climate change and market fluctuations, contributing to the resilience of the local agricultural sector and the overall well-being of the community.

9. Contribution To The Existing Knowledge

The research adds to the clarity of the enhanced production,productivity, farm efficiency and agriculture development in the research area. The research also highlights the problems faced by the farmers in this region. The research is also an attempt to reflect the major influencing factors to the modernization in agriculture in the research area. The study highlights the present status and trend of farm efficiency through modernisation in agriculture in Jharkhand and its contribution in national context. The study also focuses on the effect of agricultural modernization in the employment generation, income increment and rural development of Gumla district.

Jharkhand's agriculture has vast potential for generating employment and earning large sums of foreign exchange. Majority of the population rely on this sector for their livelihood. Much has been achieved by way of increasing productivity etc,. Yet, there are many other inefficiency needs to be improved like overirrigation, soil erosion, loss of biodiversity, farmers' awareness and etc that shall be studied, which would further add to the richness and attractions for the upcoming generations and policies.

10. Future Work

Future work in modernizing agriculture and farm efficiency will likely involve further integration of technology and data-driven practices. This could include

advancements in precision agriculture, such as the use of drones, sensors, and AI to determine soil health, optimize planting, irrigation, and pest control. Additionally, genetic engineering and biotechnology may play a larger role in developing crops that are more resilient to climate change and pests, while also increasing yields. Sustainable farming practices, such as regenerative agriculture and vertical farming, may also gain momentum to address environmental concerns and limited arable land. Overall, the future of agriculture will likely be characterized by innovation, efficiency, and sustainability.

Future work in terms of production, productivity and farm efficiency will likely involve a combination of factors such as climate change, market demands, technological advancements, and sustainability concerns. Farmers may need to adapt to shifting weather patterns by selecting crops that are more resilient to drought, floods, or temperature fluctuations. Market demands for certain crops or products may also influence cropping decisions, as well as considerations for soil health and biodiversity.

11. Tentative Chapters

Chapter I - Introduction
Chapter 2 - Overview of literature and methodology

Chapter 3 - Introduction and Area of Study

3.1 - Status of agriculture in Gumla district in Jharkhand context .

3.2 - Economic status of the respondents in the study area.

3.4 - Factors promoting agriculture modernization in Gumla.

Chapter 4- Data Analysis.

Chapter 5 - Major problems and issues in growth of modern agricultural practices in Gumla.

Chapter 6 - Conclusion / suggestions

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